Introducing

YOUR COLOR COMPUTER 2

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The warranties granted herein give the **original** CUSTOMER specific legal rights, and the original CUSTOMER may have other rights which vary from state to state.

Warning

Before inserting or removing a Program Pak™ ROM Cartridge, be sure the computer is off. If it is on, you can damage the Program Pak and the computer.

The FCC Wants You to Know . . .

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, and so on) certified to comply with the Class B limits may be attached to this computer. Operation with noncertified peripherals is likely to result in interference to radio and TV reception.
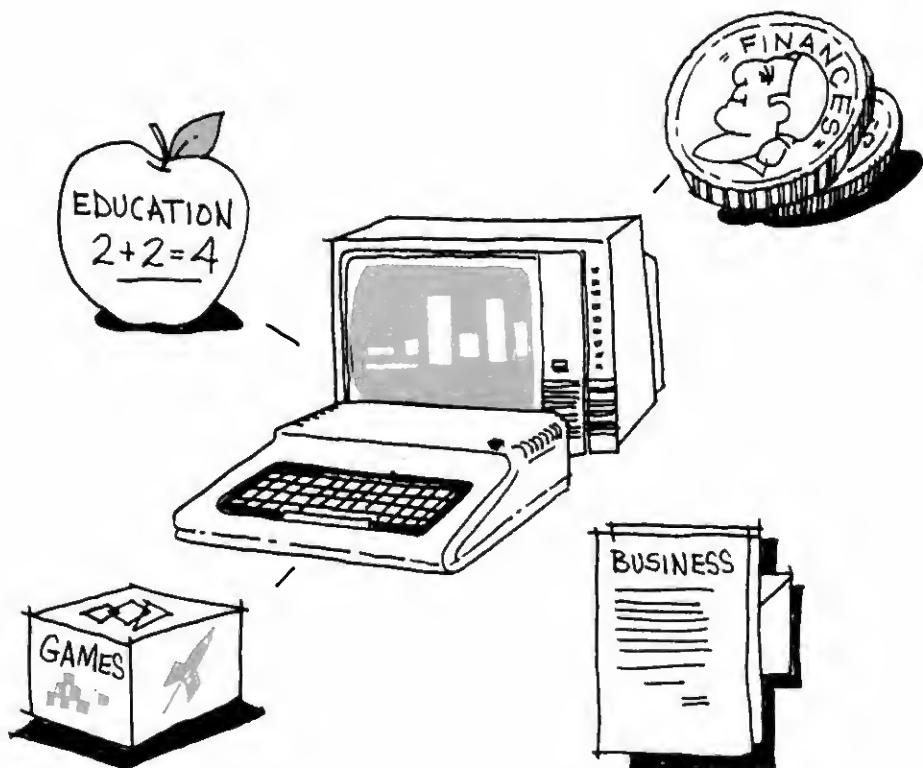
Congratulations! With your purchase of this TRS-80 Color Computer 2, you have taken the first step in one of today's most exciting adventures — personal computing. New horizons in entertainment, education, recreation, and home and financial management are now only an arm's length away. Amazement and amusement await.

Welcome to the future.

TO OUR CUSTOMERS

Your TRS-80 Color Computer 2 is more powerful and more versatile than most mammoth computers of twenty years ago. Although those metal giants filled huge, glass-walled rooms and cost millions of dollars, they couldn't sing or cipher half as well as your Color Computer can do now in your own living room.

Despite its power and complexity, your computer is simple to operate. You alone determine how "technical" a machine you want it to be.

At the simplest level of operation, all you have to do is plug in a Radio Shack Program Pak to make the Color Computer 2 obey your every whim. Each ROM cartridge you install gives your machine the "memory" of a genius . . . in accounting, in alien-zapping games, in record-keeping, or in whatever you choose. You're the master. (If you want to start using your Color Computer right away, this booklet contains all the information you'll need for Program Pak operation.)

At a slightly more advanced level, you may want to write your own programs and make your computer the most responsive and important tool in your home. Even if you're a beginner, you'll find programming is easy and fun when you follow the instructions in the BASIC programming manual that comes with your TRS-80 Color Computer. As you gradually gain control of the computer (and all its power), you'll discover that computing is as rewarding an experience as it is an enjoyable one.

If, however, you already know BASIC, and especially if you've used another model TRS-80, just read this operation manual, then use the Quick Reference Card to get right down to programming. (The Color Computer 2 has many features not found on other TRS-80s, as well as some important differences. A few minutes spent with the Quick Reference Card before you press (ENTER) could save you hours later on.)

Important Information

This equipment generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with the manufacturer's instructions, it may cause interference with radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment *does* cause interference to radio or television reception, which can be determined by turning the equipment off and on, you should try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver experiencing the interference
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver experiencing the interference are on different branch circuits

If necessary, consult the dealer or an experienced radio/television technician. You may find the following booklet, prepared by the Federal Communications Commission, helpful: *How to Identify and Resolve Radio - TV Interference Problems*. This booklet is available from the United States Government Printing Office, Washington, DC 20402, Stock No. 004-000-0035-4.

CONTENTS

WELCOME TO TRS-80® COLOR!

The Radio Shack TRS-80® Color Computer 2 system consists of:

* A 53-key console keyboard for inputting programs and data to the computer
* A television interface that lets you connect the computer to any color television set for full-color displays and a wide range of sounds
* A powerful 6809E microprocessor
* Read Only Memory (ROM) containing the Color BASIC Language
* Random Access Memory (RAM) for storing programs and data while the computer is on (amount is expandable from 16K to 64K, optional/extra)
* A ROM-cartridge slot for instant loading of Radio Shack Program Paks: games, home finance, education, and more (optional/extra)
* Two joystick interfaces for extra fun and versatility in games and special applications (requires joystick controllers, optional/extra)
* A high-speed cassette interface for permanently storing programs and data (requires a separate cassette recorder, optional/extra)
* A printer interface for printed copies of programs and data (requires a separate serial printer, optional/extra)
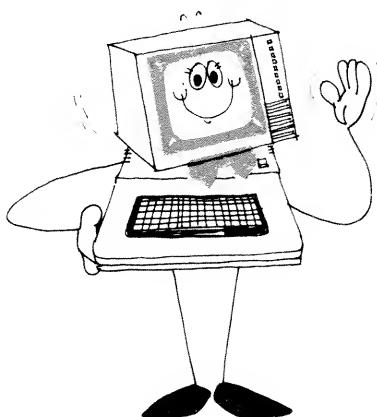
Television Output

TRS-80 Color Computer 2 connects to the antenna terminals on your color television set. The computer displays both text and graphics. Nine colors are available for graphics use. The computer also generates musical tones and special effects through your TV speaker.

Keyboard

The keyboard consists of standard typewriter characters plus several control characters. The control character keys are marked with special names — (BREAK), (ENTER), (CLEAR), (←), and so on.

6809E Microprocessor

This is the central processing unit where your computer does all its "thinking." In the TRS-80 Color Computer 2, the microprocessor operates at a speed of more than 800,000 cycles per second.

Read Only Memory (ROM)

This is where the computer stores built-in programs, including the TRS-80 Color Computer BASIC language. Each time you turn on the computer without a plug-in program cartridge, this built-in program takes charge of the microprocessor, enabling you to type in simple BASIC-language instructions.

TRS-80 Color Computer 2 with Extended BASIC contains a 16K ROM, meaning it contains 16 * 1024 = 16384 characters (bytes) of permanently programmed memory. TRS-80 Color Computer with Standard BASIC contains 8K ROM of permanently programmed memory.

Program Paks

TRS-80 Color Computer 2 has a slot for plug-in ROM cartridges (Program Paks), which can greatly expand its power and usefulness. Normally, when a ROM cartridge is installed, the computer is controlled by the plug-in program.
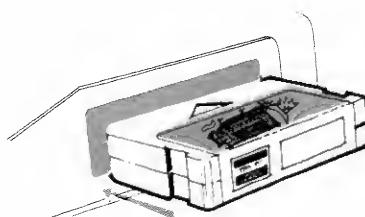
Note: Always turn the computer off before inserting or removing a ROM cartridge.

Random Access Memory (RAM)

This is where your programs and results are stored while the computer is on. It is erased when you turn off the computer.

Accessories

These are devices, such as a printer or cassette recorder, you can add to your computer to increase its usefulness in programming and data storage. TRS-80 Color Computer 2 contains the necessary interfaces to simplify the addition of many accessories.

Joystick Controllers. Adding a pair of joystick controllers gives you yet another means of inputting information and controlling the computer. The joysticks include fire-when-ready buttons and two-dimensional control sticks.
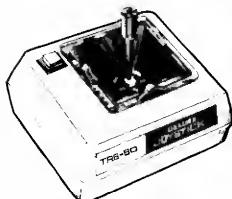
Cassette. For long-term storage of programs and data, connect a cassette recorder to the computer and save the information on tape. The TRS-80 Color Computer 2 saves programs and data on tape at approximately 1500 baud, which is roughly 11,000 characters per minute. Radio Shack's CCR-81 (Catalog Number 26-1208) comes with the necessary connecting cable and is highly recommended.
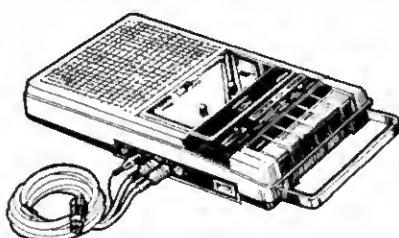
Printer. You may connect any Radio Shack serial interface printer to your Color Computer 2.

INSTALLATION

We've finally reached the part you've been waiting for — it's time to get your Color Computer "up and running."

Carefully unpack the computer. Be sure to remove all cables and papers in the shipping carton. Try to keep all the packing material intact so you can use it if you ever need to transport the computer.

Place the computer on a solid surface near the television set. The television and computer should be near a power outlet so you will not need to use an extension cord to operate them.

But don't plug in the computer yet.
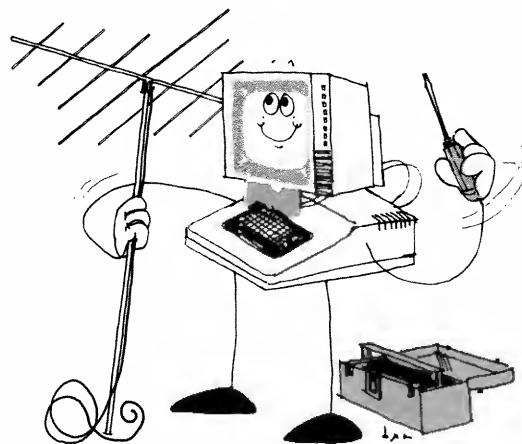
That's a Switch

Not only is your computer a computer, it's also a miniature television broadcasting station. A built-in television interface (called an RF Modulator) sends out a VHF signal that your set "sees" the same way it "sees" a network television show.

The Antenna Switchbox that comes with your computer lets you select either television-station reception or computer input without having to connect and disconnect the computer every time it's used. This Antenna Switchbox consists of a short section of twin-lead cable, two screw terminals, a coaxial connector, and a slide switch.

We suggest you attach the Switchbox to the back of your TV set (see Figure 1).

Select a smooth, flat surface on the back of the television that is well within reach of the antenna cables. Wipe off any dust, dirt, or grease from the mounting surface, then remove the backing from the double-sided adhesive tape on the Switchbox. Press the Switchbox against the back of your TV cabinet in the desired location.
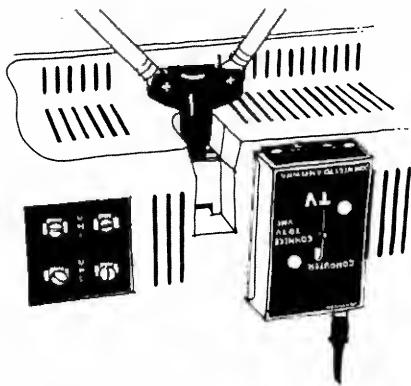

Figure 1. Mounting switchbox onto TV Set (connections may vary, depending on your antenna installation).

Aerial Acrobatics

Disconnect the antenna wires presently attached to the VHF screw terminals on your set. In their place, attach the short twin-lead wires from the Switchbox labeled CONNECT TO TV VHF.

What you do next depends on the type of antenna installation you have.

If you have an **Internal Antenna** or **Rabbit Ears** or a **300-Ohm-Lead-In External Antenna**, connect your VHF antenna leads to the Antenna Switchbox terminals labeled CONNECT TO ANTENNA (see Figures 2, 3, and 4).
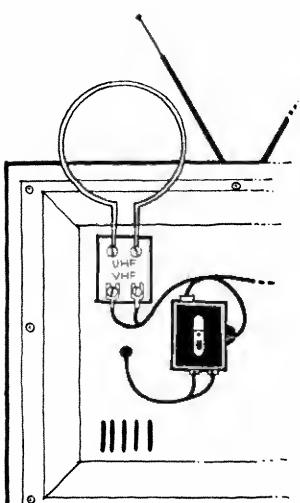
Figure 2. Rear view of TV with screw terminals and internal antenna.

Figure 3. Rear view of TV with twin-lead and an external antenna.
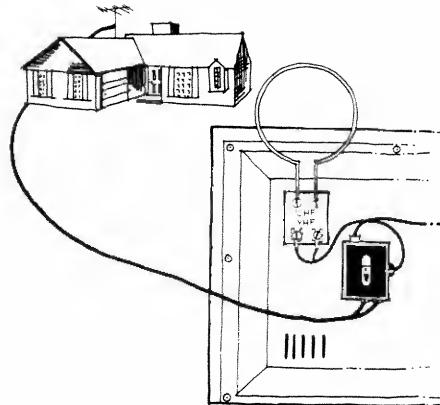
Figure 4. Rear view of TV with twin-lead and rabbit ears antenna.
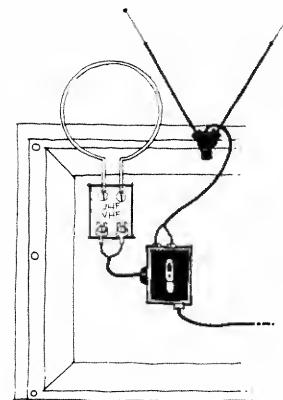
If you are making a connection to a TV with a **75-Ohm Coaxial Lead-In**, obtain a special 75-Ohm to 300-Ohm matching transformer such as Radio Shack's Catalog Number 15-1140. Connect your antenna's coaxial cable lead-in to the transformer, then attach the transformer's twin-lead to the screw terminals on the Antenna Switchbox (see Figure 5).

Figure 5. Rear view of TV with 75-Ohm coaxial cable.
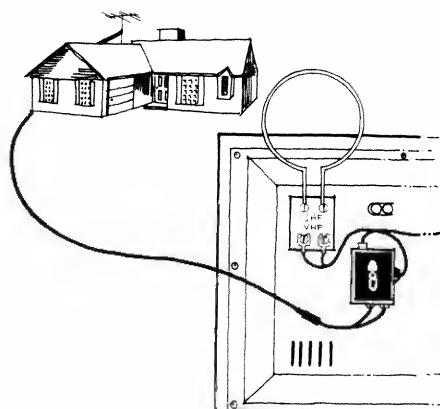
If you have a **75-Ohm Coaxial Lead-In and a Matching Transformer**, connect the short twin-lead from the transformer to the screw terminals on the Antenna Switchbox (see Figure 6).
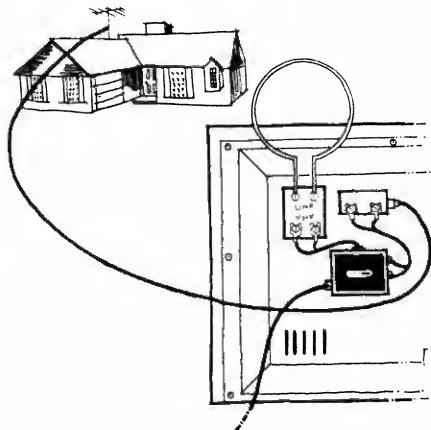
Figure 6. Rear view of TV with a 75-Ohm coaxial cable and a matching transformer.

The antenna installations described above are the most common types; however, you may need to know about a few other antenna types and features.

If your TV set has a 75/300-Ohm switch on the back, be sure to set the switch in the 300-Ohm position.

If your TV set has a round jumper cable protruding from the back, be sure the jumper cable is attached to the connector next to it.

If you have cable TV, you may want to contact a qualified service technician for installation assistance.

When your antenna system is properly hooked up to the Antenna Switchbox, connect the computer's coaxial cable from the TV jack on the back panel of the computer to the jack labeled COMPUTER on the Switchbox (see Figure 7).
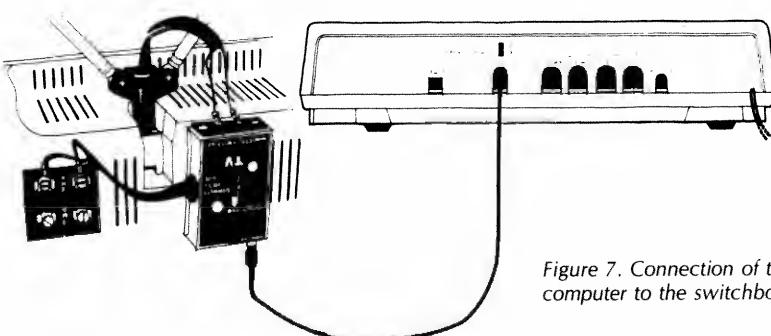
Figure 7. Connection of the computer to the switchbox.

Your Color Computer 2 is ready to use.

Connection of Other Accessories

Before connecting any accessory (a serial line printer, for example), be sure the computer and the accessory are both turned OFF.

Connect all accessories to the appropriate jacks on the rear panel of the computer. (See Figure 8 for location of connection points.) For interconnections between computer and accessories, refer to the owner's manual supplied with the accessory.
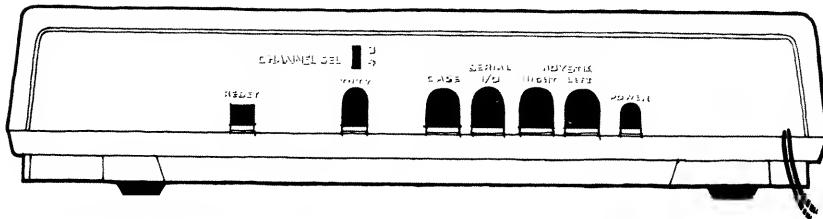
Figure 8. Computer
controls and connections.

Connection to an AC Power Source

Be sure the computer and all accessories are turned OFF. Connect it and all accessories to an appropriate power source. Power requirements for Radio Shack products are specified on the units and in the Owner's Manual Specifications.

OPERATION

The following instructions for the start-up and use of the Color Computer 2 are for the ROM-based system **only**. If you have a disk-based system, see the *Disk System* owner's manual.

Adjustments for All

Be sure your computer is turned OFF before making the following adjustments.
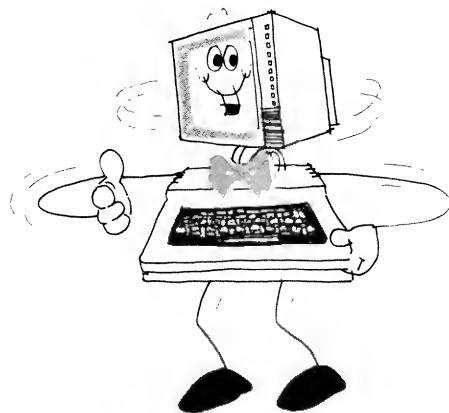
First, turn on your television and set the volume at a normal listening level.

Next, select Channel 3 or 4 (whichever is weaker or not being used in your area). Select the same channel on the slide switch on the back panel of your computer. This is the channel on which your computer will "broadcast."

Finally, set the switch on the Antenna Switchbox to the COMPUTER position.

Power Play

The power-on button is at the left-rear of the computer case as you face the keyboard. Turn on the computer by pressing the button in and then releasing it.

When you power-up the computer without a cartridge installed, the screen displays a start-up message that describes your version and release of Color BASIC followed by

OK

If this message doesn't appear, first be sure the television set is turned on and operational. If it is, check your set's brightness, contrast, and fine tuning controls and be sure they are adjusted properly. If the message still doesn't appear, turn off the system, recheck all the connections, and try again. (For further assistance, see the "Troubleshooting and Maintenance" section in this booklet.)

Get RESET . . . Go

The RESET button, located at the right-rear of the computer as you face the keyboard, lets you stop a ROM program and then restart it at the beginning without turning the computer off and on. Pressing RESET doesn't erase the contents of memory like turning the computer off does. Therefore, when you are programming in Color BASIC, RESET stops execution but leaves your program intact.

A Turn-off

To turn off your computer, press the power button at the left-rear of the computer case.

If you turn off the computer and then decide you want to use it again, **always leave it off for at least 15 seconds before turning it on**. The computer's power supply needs this much time to discharge its stored energy before you start it up again.

Keep in mind that turning off the computer erases all RAM-based programs and data from memory. If you want to save data or a program, do it before you turn off the computer. (See the "Using the Cassette Recorder" section.)

THE KEYBOARD

Although your Color Computer's keyboard looks like a typewriter at first glance, it's actually much more versatile and sophisticated. Not only does it have all the letters, numbers, and characters of a typewriter, it also has many special keys that make typing and computing much easier. The ⊖ key, for example, moves the cursor left one space and deletes the last character typed. (The cursor, by the way, is the blinking light that lets you know exactly where you are typing on the screen.)
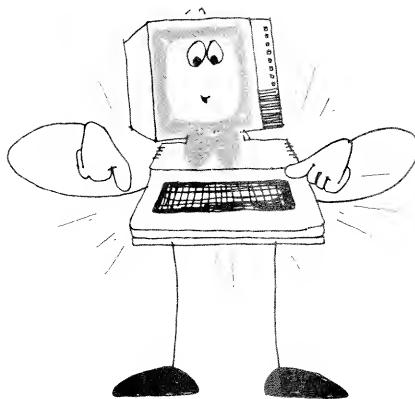
The Keys to Computing

KEY	FUNCTION
(←)	Backspaces and deletes the last character typed.
(SHIFT) (0)	Switches to all-caps from upper/lowercase mode; switches to upper/lowercase from all-caps mode.
(SHIFT) (→)	Displays a right bracket (])
(SHIFT) (↓)	Displays a left bracket([)
(SHIFT) (@)	Pauses a program or listing. Press any key to continue.
(SHIFT) (↑)	Displays back arrows.
(SHIFT) (←)	Deletes the current line and starts over.
(CLEAR)	Cancels the current line, deletes the display, and positions the cursor in the upper left corner ("home").
(ENTER)	Enters the line. Color BASIC does not interpret a line until you press (ENTER).
(BREAK)	Interrupts the current program or operation and prepares the computer for another keyboard command.

A Capital Idea

Whenever you turn on the Color Computer 2, you are automatically in the "all-capitals" (CAPS) mode, and the keyboard always prints capital letters whether or not you press the (SHIFT) key. This function is built into the computer because your computer's "language" (Color BASIC) "understands" only commands printed in capital letters.

At times, however, you may want to use both uppercase and lowercase letters. For example, you may want to create documents on a printer or send information to another computer through the serial communications port. You can do this with a special "upper/lowercase" mode.

To activate the upper/lowercase mode, press (SHIFT) (0). Now you must press (SHIFT) to generate capitals. **Note:** Since the computer can only display capitals on the TV screen, lowercase letters appear as capitals "in reverse," that is, the background color is black and the letters are in green.

When you want the computer to "hear" your commands again, just switch back to the "all-capitals" mode by pressing (SHIFT) (0).

USING THE TELEVISION

Color is the TRS-80 Color Computer's middle name . . . and your computer's built-in flair for flights of light and sound lets you make computing the brightest and most exciting adventure this side of the Land of Oz.

The Color Computer can produce nine distinct colors: black, green, yellow, blue, red, buff, cyan, magenta, and orange. The color tones you actually see, however, depend on the *quality and color adjustment of your television set* — not on the computer.

Until now you've probably seen little more on your TV screen than a green background framed by black. A small rectangular cursor also blinks somewhere on your screen, constantly flashing through the spectrum of colors. When you turn on the computer without a Program Pak, the background is automatically set to green, and the characters display in black because Color BASIC "understands" only commands in black on green. (Remember that lowercase letters are inverted as green letters on a black background and therefore the computer cannot "read" them.)

When you use a plug-in ROM Program Pak, the cartridge program determines the color on your television screen. However, when you use Color BASIC, *you* control the colors. For example, type:

CLS 3 (ENTER)

The computer obeys your "command" and changes its background color from green to blue. Although you may not realize it, you just took an important step — you are now a computer programmer.
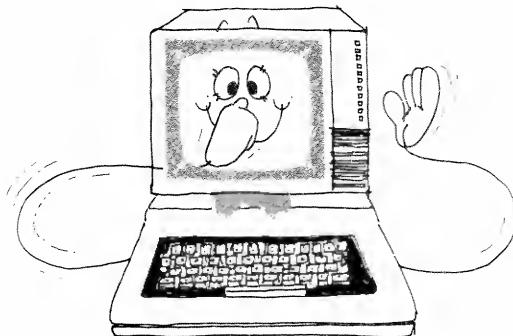
Getting Out of Prism

A program is a set of instructions that causes a computer to perform certain operations. That's it. That's all there is to it.

For example, if you want to take complete control of your television display's background color, all you have to do is type in **CLS**, then a **code** number from 0 to 8, and then press (ENTER). Try it.

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Your "program" is CLS *code*, where *code* is one of the following numbers:

CODE	FOR THIS COLOR
0	Black
1	Green
2	Yellow
3	Blue
4	Red
5	Buff
6	Cyan
7	Magenta
8	Orange

Note: Whenever you clear the screen by pressing (CLEAR), the display automatically reverts to the Color BASIC green screen, no matter what background color was previously displayed.

So far you've only seen your computer's colors one at a time. Now let's take a look at them all at once so you can properly adjust your television set.

Start Color BASIC by pressing the RESET button, and then type in the following program. Don't worry about spacing, but be sure you type everything else *exactly* as listed below:

```
NEW (ENTER)
10 FOR X = 0 TO 63 (ENTER)
20 FOR Y = 0 TO 31 (ENTER)
30 C = INT (X/8 + 1) (ENTER)
40 SET (X,Y,C) (ENTER)
50 NEXT Y, X (ENTER)
60 GOTO 60 (ENTER)
```

To check your program for typing errors, display (list) the program by typing:

```
LIST (ENTER)
```

It should look like this:

```
10 FOR X = 0 TO 63
20 FOR Y = 0 TO 31
30 C = INT (X/8 + 1)
40 SET (X, Y, C)
50 NEXT Y, X
60 GOTO 60
```

If you find any mistakes, retype the line, beginning with the line number. Now type:

```
RUN (ENTER)
```

Your screen displays eight color-bars on a black background. The order of the bars is green, yellow, blue, red, buff, cyan, magenta, and orange. Now, use the color adjustment controls on your television to set the colors to their proper hue.

This program lets you adjust your television for the best possible spread of colors. But, remember, the range of adjustment varies, depending on the condition and quality of your TV set.

Press (BREAK) to stop the program.

Journey to the Center of Your Screen

This next program helps you center your computer display on the television screen. Type:

```
NEW (ENTER)
 10 CLS (ENTER)
 20 FOR X = 0 TO 63 (ENTER)
 30 Y = 15 (ENTER)
 40 RESET (X,Y) (ENTER)
 50 NEXT X (ENTER)
 60 FOR Y = 0 TO 31 (ENTER)
 70 X = 31 (ENTER)
 80 RESET (X,Y) (ENTER)
 90 NEXT Y (ENTER)
100 GOTO 100 (ENTER)
```

To check for errors, type:

```
LIST (ENTER)
```

It should look like this:

```
 10 CLS
 20 FOR X = 0 TO 63
 30 Y = 15
 40 RESET (X,Y)
 50 NEXT X
 60 FOR Y = 0 TO 31
 70 X = 31
 80 RESET (X,Y)
 90 NEXT Y
100 GOTO 100
```

If you find an error, retype the line, beginning with the line number. Next type:

```
RUN (ENTER)
```

You should now have a green background, surrounded by black, with black horizontal and vertical lines intersecting at the exact center of the screen.

The Color Computer 2 generates a rectangular image designed to fill most of your TV's screen. Adjust your television's horizontal- and vertical-centering controls until this image is centered as best as possible.

Don't worry if you can't get a perfectly centered image or if you notice slight distortions in certain areas of your screen. These minor variations depend on the condition of your TV set. (If the distortions are severe, however, consult a qualified TV service technician.)

Sound and Safe

Not only is your Color Computer a clever creator of kaleidoscopic colors, it's also a singularly sophisticated singer of songs.

When you use a plug-in Program Pak cartridge, the cartridge program determines the sounds you hear. When you use the built-in Color BASIC language (by starting-up without a cartridge in the slot), you can actually "program" the sounds you want to hear.
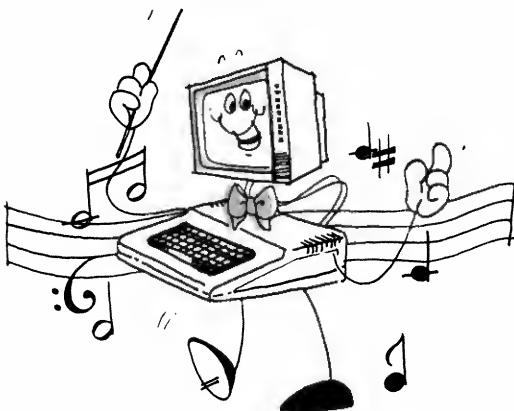
Your Color Computer is a superb singer, and you have nearly total control over the quality of the sound the TV set produces. For example, type:

```
SOUND 39,20  ENTER
```

The computer obeys your "command" and produces a musical note that lasts 1.2 seconds. The "program" is SOUND *pitch-code,duration*. *pitch-code* is any number in the range 1 to 255 (1 is the lowest pitch, 255 the highest) and *duration* is any number in the range 1 to 255 (this sets the duration of the tone in units of .06 second).

Your Color Computer has quite a range of sounds. The following program lets you hear the entire frequency range (codes 1-255) that Color BASIC can produce:

```
NEW  ENTER
10 FOR X = 1 TO 255  ENTER
20 SOUND X,1  ENTER
30 NEXT X  ENTER
```

To check for typing errors, type:

```
LIST  ENTER
```

It should look like this:

```
10 FOR X = 1 TO 255
20 SOUND X, 1
30 NEXT X
```

Check for typing errors as you did in the previous programs. When you're sure you've typed everything exactly as above, set your television volume control to a normal level, and type:

RUN (ENTER)

If you want to hear more of what your Color Computer is capable, type in this short program:

```
NEW (ENTER)
10 X = RND (255) (ENTER)
20 Y = RND (30) (ENTER)
30 SOUND X,Y (ENTER)
40 GOTO 10 (ENTER)
```

To check for typing errors, type:

LIST (ENTER)

It should look like this:

```
10 X = RND (255)
20 Y = RND (30)
30 SOUND X,Y
40 GOTO 10
```

When you're sure the program is correct, type:

RUN (ENTER)

The music your computer plays will never be heard at Carnegie Hall, but it is nevertheless remarkable. You see, your computer plays random notes for random durations. And although it isn't Beethoven, your Color Computer is actually "composing" music.

Press (BREAK) to stop the program.

25

PROGRAM PAK INSTALLATION

Your Color Computer is amazingly versatile. It's a master of chess, a wizard at fantasy games, a tireless and efficient bookkeeper-secretary, a noted musician, and much more.

But its talents are only potential until it has two more things. First, it needs a memory. Then it needs you.
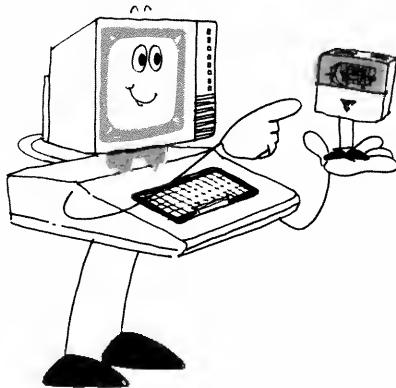
Programs, such as those listed earlier in this booklet, give your computer the memory it needs to carry out specific tasks. Those programs are so simple that you can probably write some like them after a few days with your BASIC programming manual. The most sophisticated programs, however, may take hundreds or thousands of hours to develop and produce.

Radio Shack's preprogrammed ROM cartridges let you begin using your Color Computer immediately . . . for tasks as complex as playing a chess game, as detailed as maintaining financial records for a small business, and as educational as learning a foreign language.

Program Paks plug into the cartridge slot on the right side of your computer. Although they are the simplest and most effective means of programming your computer, ROM cartridges are sensitive electronic devices that you must handle carefully to protect them (and your computer) from damage.

NEVER PLUG IN A CARTRIDGE WHILE YOUR COMPUTER IS TURNED ON. The computer must always be turned OFF whenever a ROM cartridge is either plugged in or removed.
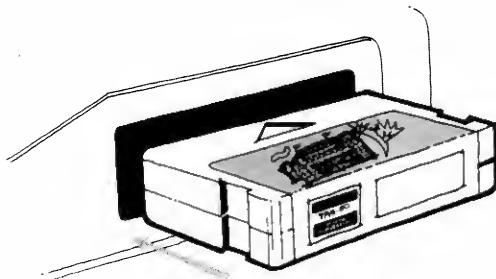
NEVER INSERT YOUR FINGERS OR OTHER OBJECTS INTO THE CARTRIDGE SLOT. Doing so could seriously damage your computer.

To install a Program Pak, first locate the cartridge slot on the right side of the computer. Carefully insert the cartridge with the label side up and the open end facing into the slot. The cartridge should slide smoothly into the recessed receptacle in the computer case.

If you have difficulty inserting the cartridge, it may be upside down. Be sure the label is facing up, and then try again.

To remove a cartridge, FIRST TURN THE COMPUTER OFF, then gently pull out the cartridge. Store it in a safe place.

USING THE
JOYSTICK CONTROLLERS

Joystick controllers (Radio Shack Catalog Number 26-3008) are among the most popular accessories for the Color Computer. Most commonly used with computer games, joysticks are important in any application that involves translating two dimensional hand movement into computer input.


Depending on which ROM cartridge or BASIC program you use, joysticks let you alter the direction of a moving object on the television screen, reposition the cursor to different program options, draw diagrams on the video display screen, or make other adjustments where vertical and horizontal motions must be translated into signals that the computer "understands."

Each joystick consists of a control stick that lets you input two-dimensional movements into the computer and also a "fire" button that performs a different function in different programs. The "fire" button might launch a missile in an arcade game, execute a command in an educational package, or cause a variety of actions to occur in other types of programs.

Your joystick controllers connect to the back of the computer only in the two jacks marked JOYSTK RIGHT/LEFT. It doesn't matter which joystick you use in either jack; the controllers are interchangeable.

Note: When using Color BASIC instead of a plug-in cartridge, you generate a stream of characters whenever you press the "fire" button. This is a normal "side effect" and can be ignored.
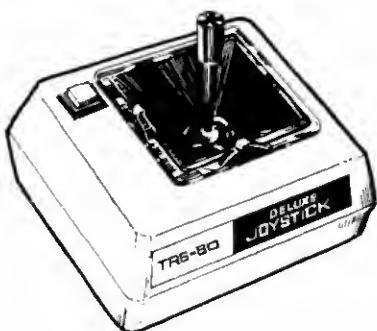
THE JOYSTICK CONTROLLERS FUNCTION ONLY IN PROGRAMS WRITTEN SPECIFICALLY FOR THEIR USE.

USING THE CASSETTE RECORDER

Your computer has a type of amnesia every time you turn it off. When you turn it on again, it remembers only its Color BASIC language. The rest of its memory is gone.

This lets you reprogram your computer for different tasks. It is infinitely more versatile than the "computer" in a digital watch or a microwave oven, which has a permanent memory with a single function that you can never alter.

When you connect a cassette recorder to the Color Computer 2, you dramatically increase its power and versatility. Since thousands of cassette-based programs have been written for the Color Computer, you may use the cassette recorder to expand your library of useful programs.

You may also use the recorder as an information storage bank for many Program Paks or other cassette programs. "Color SCRIPSIT" (Catalog No. 26-3105), for example, lets you save letters, reports — even the Great American Novel — on cassette tape. Another Program Pak, "Color File" (Catalog No. 26-3103), lets you store and manipulate addresses, personal records, and many other types of useful data. All this, and much more, is possible — even if you know absolutely nothing about computer programming.
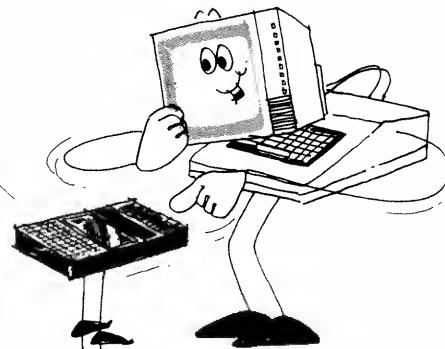
If you *do* know BASIC, you can store programs and data on cassette tape instead of having to retype them every time you start up the computer. With the Radio Shack CCR-81 cassette recorder, you can transfer programs and data from tape to computer at a rate of 1500 baud (about 190 characters per second, or 11,000 characters per minute). By using cassette data storage, in a matter of minutes you can reload programs into memory instead of typing them in and then debugging them, a process that can take hours.

Note: Although you may use other recorders with the Color Computer, we strongly recommend that you use the Radio Shack CCR-81. The overall operation of the CCR-81 and the following connections, adjustments, and settings are thoroughly tested and documented with the Radio Shack product (Catalog Number 26-1208) but may vary with other recorders.
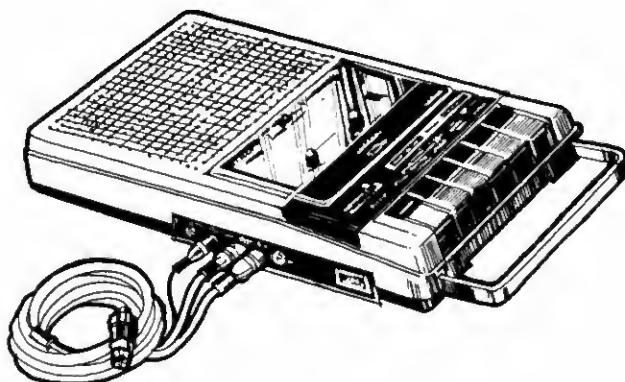
Making the Right Connections

Connect the cassette recorder to the computer if you wish to record and save your programs, use cassette-based prerecorded programs, or use a program (such as Color SCRIPSIT) that requires a cassette recorder to store information.

The following instructions assume you are using the CCR-81 Cassette Recorder.

A Color Computer/Cassette Recorder connection cable is included with your CCR-81, and we suggest you use this particular cable because it is specially designed for cassette installation.

1. Connect the short cable (DIN plug on one end and three plugs on the other) to the **CASS** jack on the back of the computer. **Be sure you get the plug to mate correctly.**

2. The three plugs on the other end of this cable connect to the recorder.

3. A. Connect the **black plug** into the EAR jack on the side of the recorder. This connection provides the output signal from the recorder to the computer for loading tape programs into the Color Computer.

   B. Connect the **larger gray plug** into the AUX jack on the recorder. This connection provides the recording signal to record programs from the computer onto the tape.

   Leave the AUX plug in whether you are recording or playing back cassette data.

C. Connect the **smaller gray plug** into the smaller MIC jack on the recorder. This lets the computer automatically control the recorder motor (turn tape motion on and off for recording and playing tapes).

Note: Do not plug a remote microphone or a dummy plug into the larger MIC jack.

Adjust the volume control on your cassette recorder carefully. With the Radio Shack CCR-81 recorder, set the volume between 3 and 10. The recommended setting is 5.

CSAVEing a Lot of Time

When you want a permanent copy (one you won't have to retype) of a Color BASIC program, save it on tape with the **CSAVE** command.

Note: We don't recommend recording over old programs. Bulk erase the tape first.

After you type the program into the computer's memory, follow this procedure:

1. Insert a blank cassette tape into the recorder.

2. Press the recorder's PLAY and RECORD buttons at the same time until they lock.

3. Name the program you want to SAVE. You may use any name with 8 or fewer letters as this "*file-name.*" To save the program on tape, type:

    CSAVE "*file-name*" (ENTER)

    Note: Don't forget the quotation marks around the file-name.

4. The tape recorder's motor starts when you press (ENTER).

5. When the program is saved, the screen displays:

    OK

    and the recorder's motor automatically shuts off.

The program is still in the computer's memory, but now it is also on tape.

It's a good idea to make more than one copy of a program, preferably on separate cassettes, just in case one is lost or inadvertently erased.

CLOADing Zone

Loading a program from a cassette tape into the computer is as simple as saving a program.

1. Be sure the tape is fully rewound and the plugs are all in place.

2. Press the PLAY button on the recorder until it locks.

3. To erase any existing programs, type:

    NEW `(ENTER)`

4. Type the CLOAD command and the name of your program:

    CLOAD "*file-name*" `(ENTER)`

    The tape recorder's motor starts when you press `(ENTER)`.

    The computer searches for and loads the program you indicate. While it searches for the program, the letter S appears in the upper left of the television screen.

    When the computer finds the program, the letter F and the file-name appear at the top of the screen.

5. When the program is loaded, the screen displays:

    OK

Note: If you are certain your tape has only one program saved on it, you can type CLOAD without a file-name since the computer loads the first program it encounters.

SKIPFing Classes

The SKIPF command lets you build and manage a large library of Color Computer programs on cassette. SKIPF (which stands for "skip until you find") makes it easy to (1) store many programs on one tape and (2) later find specific programs quickly and easily.

To CSAVE more than one program on a tape, you must be sure you're not recording over another program. SKIPF gives you an easy way to position the tape at the end of your last program.

1. Rewind the tape to the beginning.

2. Press the PLAY button until it locks.

3. Type SKIPF and the name of the last program on your tape. For example, if your last program is named "NAME", type:

    SKIPF "NAME"

    The computer notifies you when it Finds the program called NAME. When it reaches the end of NAME, the recorder's motor stops and your screen displays:

    OK

4. Once you've positioned the tape to the end of the last program, press the RECORD and PLAY buttons, name your program, and CSAVE it.

If you can't remember the name of your last program, type in an improbable file-name such as:

    SKIPF "X"

and watch the screen. The computer displays the name of each program it encounters on the tape. It prints an I/O ERROR when it

reaches the end of the tape, but don't worry about that. You've found what you were looking for — the name of the last program on the tape.

After you've saved many programs on one side of the tape, the SKIPF command also lets you search through the cassette to find a specific program.

1. Rewind the tape to the beginning.

2. Press PLAY on the recorder until it locks.

3. Type:

    SKIPF "file-name" (ENTER)

4. When the computer locates the program, the screen displays:

    OK

Note: If you've forgotten the file-name of the program you wish to run, use a nonexistent file-name (like SKIPF "X") to list *all* the programs on the tape.

Copy Right Protection

Here are some tips for making good recordings:

• When you're not using the computer to SAVE or LOAD programs, don't leave the recorder's RECORD or PLAY buttons down. Press STOP.

• You can avoid many problems with tapes by using new, high-quality Radio Shack Computer tapes (Catalog Number 26-301) whenever you save a program or data.

• If you want to reuse a prerecorded tape, first erase the contents with a bulk tape eraser (Catalog Number 44-210) to be sure you erase everything. Even though the recording process erases the old recording, just enough information may be left to confuse the new recording.

• If you want to save a taped program permanently, break off the Erase Protect tab on the cassette (see your tape recorder manual). Without the tab you can't press the RECORD button on your recorder. This keeps you from accidentally erasing that tape.

Error Conditioning

Several possible error messages may appear in the upper left of the television screen when a mistake is made during a loading operation. Consult your Quick Reference Card for explanations of the error messages.

Note: If you try to load a blank tape, your TRS-80 Color Computer 2 searches for the program until the tape ends without giving any indication the tape is blank. Press RESET to stop the loading process.

TROUBLESHOOTING AND MAINTENANCE

If you have problems operating your TRS-80 Color Computer 2, check the following table of symptoms.

If you don't find the cure, take the unit to your local Radio Shack, where it will be fixed promptly and returned to you.
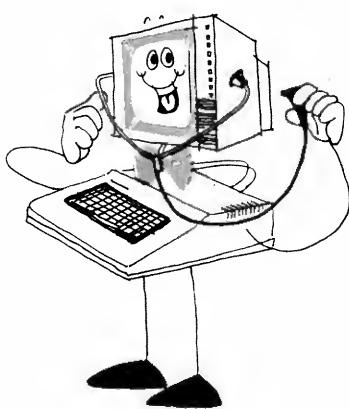
Medicine for the Melancholy

Symptom	Cure
The OK (or appropriate prompt message if you are using a ROM cartridge) doesn't appear when you turn on the computer.	1. No AC power. Check the power cord connection. 2. Incorrect power-up sequence. All accessories should be ON before you turn on the computer. 3. Accessory device (for example, printer) is not connected properly. Recheck connection. 4. Your television screen needs adjustment. Check the contrast, brightness, and fine tuning controls. 5. Antenna Switch should be set to COMPUTER not to TV.

Symptom	Cure
Poor reception or fuzzy display.	1. Be sure the TV is set on the proper channel (3 or 4 — whichever gives the best display). 2. Check the antenna connections to be sure they are connected both securely and properly. 3. Your television set needs adjustment. Check the contrast, brightness, and fine tuning controls.
Your cassette program won't load.	1. Improper cassette connection. Check connection instructions in cassette owner's manual. 2. Cassette volume is too low or high. Check the recorder's volume control. 3. Information on tape may have been garbled due to electricity discharge, magnetic field, or tape deterioration. Try to load the duplicate copy, if you have one.
The computer "hangs up" during normal operation, requiring RESET or power-off/on.	1. Fluctuations in the AC power supply. See AC Power Sources. 2. Defective or improperly installed connector. Check all connection cables to see that they are securely attached and that they are not frayed or broken. 3. Programming. Recheck the program.
"Ghosts" or mixed computer and TV reception.	Try using the other TV channel (3 or 4).

Current Events

Computers are sensitive to fluctuations in the power supply at the wall socket. This is rarely a problem unless you are operating in the vicinity of heavy electrical machinery. The power source may also be unstable if some appliance or office machine in the vicinity has a defective switch that arcs when turned on or off.

Your Color Computer 2 is equipped with a specially designed, built-in AC line filter. It should eliminate the effects of ordinary power-line fluctuations.

However, if the fluctuations are severe, you may need to take some or all of the following steps:

- Install bypass or isolation devices in the problem-causing devices
- Fix or replace any defective (arcing) switches on lights or appliances
- Install a separate power-line for the computer
- Install a special line filter designed for computers and other sensitive electronic equipment

Power-line problems are rare, and many times you can prevent them by choosing a proper installation location. The more complex the system and the more serious the application, the more consideration you should give to providing an ideal power source for your computer.

Remember the Maintenance

Your computer requires little maintenance. It's a good idea to keep it clean and free of dust build-up. This is especially important for the keyboard. Radio Shack sells a custom-designed Color Computer 2 dust cover you may find helpful.

If you need to clean the computer case, use a damp, lint-free cloth.

The accessory devices (cassette recorder, line printer, and so on) may require more maintenance. Check the owner's manual for each accessory in your system.

SPECIFICATIONS

AC Power Supply

Power Requirements   105-130 VAC, 60 Hz
Current Drain   0.18 Amps RMS

Environmental Specifications

Temperature   55°F to 85°F (12.8°C to 29.4°C)
Altitude   −100 to 6000 feet (-30 to 1830
   meters) above sea level

Microprocessor

Type   6809E
Clock Rate   0.895 MHz

Serial Interface

Standard RS-232-C Signal		Pin #
CD	Carrier Detect (Status Input Line)	1
RD	Receive Data	2
GROUND	Zero Voltage Reference	3
TD	Transmit Data Out	4

RS-232 Pin Location

Looking from the outside at the RS-232-C jack on the Color Computer.
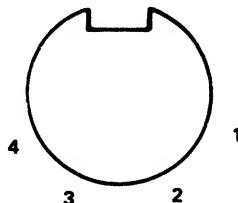
Printer Software Requirements

600 Baud
1 Start Bit (logical zero)
8 Data Bits (LSB first)
2 Stop Bits (logical one)
No Parity
132-Column Printer Width
Automatic Carriage Return at End of Line

Cassette Interface

Suggested Input Level for Playback from Recorder — 1 to 5 Volts peak-to-peak at a minimum impedance of 220 Ohms

Typical Computer Output Level to Recorder — 800 mV peak-to-peak at 1K Ohms

Remote On/Off Switching Capability — 0.5 A maximum at 6 VDC

Cassette Jack Pin Location

Looking at the outside of the jack on the computer

1. Remote Control
2. Signal Ground
3. Remote Control
4. Input from Recorder's EARphone Jack
5. Output to Recorder's AUX or MIC Jack
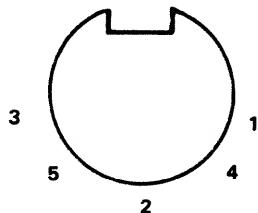
Joystick Controller Jack Pin Location

Looking at the outside of the jack on the computer.

1. Comparator Input (Right-Left)
2. Comparator Input (Up-Down)
3. Ground
4. "Fire" button, High when open, Low when closed.
5. Vcc, current-limited +5VDC
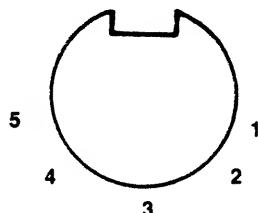
CUSTOMER INFORMATION

Service Policy

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all its computer products, in most instances. Warranty service will be performed in accordance with Radio Shack's Limited Warranty. Nonwarranty service will be provided at reasonable parts and labor costs.

Because of the sensitivity of computer equipment, and the problems that can result from improper servicing, the following limitations also apply to the services offered by Radio Shack:

1. If any of the warranty seals on any Radio Shack computer products are broken, Radio Shack reserves the rights to refuse to service the equipment or to void any remaining warranty on the equipment.

2. If any Radio Shack computer equipment has been modified so that it is not within manufacturer's specifications, including, but not limited to, the installation of any non-Radio Shack parts, components, or replacement boards, then Radio Shack reserves the right to refuse to service the equipment, void any remaining warranty, remove and replace any non-Radio Shack part found in the equipment, and perform whatever modifications are necessary to return the equipment to original factory manufacturer's specifications.

3. The cost for the labor and parts required to return the Radio Shack computer equipment to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.